

COST ALLOCATION

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I. COST ALLOCATION CONCEPTS

Cost allocation is a method to determine the cost of services provided to users of that service. It does not determine the price of the service, but rather determines what the service costs to provide. It is important to determine the cost allocation of the services that the FAA provides, in order to determine a justifiable fee/charge/tax for those services.

Included in cost allocation are direct, indirect, and incremental costs. Direct costs, or separable costs, are costs that are related to a single type of service and are related to one type of output or user such as, a sector-to-sector hand-off. Indirect costs, or common costs, are related to more than one type of service, such as, the physical enroute facility. Incremental costs change with the level of output produced. Incremental costs measure changes in output, e.g., differences in staffing levels or staffing costs at a facility that is based on traffic count.

The GRA Cost Allocation Study

The GRA Cost Allocation Study was intended to provide a base of information for the establishment of user fees and/or aviation taxes to finance FAA programs. Prior FAA cost allocation studies have been used to support the authorization of taxes that were paid into the Airport and Airway Trust Fund to finance all of FAA's capital programs and a portion of its operating budget. Data from the GRA study could be used to help determine the feasibility and equity of alternative financing mechanisms. In addition, the GRA Study provides detailed data on both the costs of producing FAA services and on the users of these services.

FAA's spending is broken down into four major areas; Operations and Maintenance(O&M); Facilities and Equipment(F&E); Research, Engineering and Development(R,E&D); and Airport Improvement Program(AIP). The GRA Cost Allocation Study allocates the cost of FAA services in these four areas provided to eleven specific user types and to overflight aircraft. These allocations were based on the full cost of all FAA services, including the incremental cost of providing services, the direct cost of producing non-Air Traffic Service, and an allocation of program support, administration and capital costs which are common or fixed costs.

Costs were initially assigned to the seven lines of FAA business. They were then adjusted to reflect that some lines of business produce services for other parts of FAA and not for external customers. The costs of these internal services were reassigned to those lines of business that deliver services to external customers. Once final lines of business costs were determined, unit costs of services were estimated, using statistical cost models and other analyses. In order to examine issues of cost allocation and recovery for the eleven user types and overflights, disaggregated data on aviation activity was used. The final allocation of costs to users was based on detailed activity data in conjunction with the estimated unit costs of producing FAA services. Users were also allocated a share of any common or fixed costs of production.

The following user types were employed in the study; commercial users, including domestic jet, charter, all-cargo, international commuter, and air taxi; general aviation (GA) users, including GA piston, GA turbine, and GA rotocraft; public users, including military and other public aircraft; and overflights. Overflights are flights that neither takeoff or land in the U.S., but fly through U.S.-controlled airspace.

The FAA costs allocated to users in the GRA Study were comprised of the following:

1. Direct costs of non-ATS(Air Traffic Services) services produced.
2. Allocation of non-ATS common and fixed costs.
3. Incremental costs of ATS services consumed.
4. Allocation of ATS common and fixed costs.

Costs for the ATS line of business were treated differently than non-ATS, due to production process differences. ATS facilities produce very few differing types of outputs and models were developed for the various facility types. Non-ATS lines of business produce diverse outputs and models were not developed for these, due to the large degree of differing services/products produced by the Non-ATS lines of business

The GRA Study used Ramsey Pricing to allocate FAA's common and fixed costs to users. Ramsey Pricing was applied by varying the amount of common and fixed costs allocated to user type based on the likely impact of such a cost change on user behavior. Users whose demand for service is more (less) sensitive to cost changes were allocated a proportionally smaller (larger) amount of common and fixed costs. Ramsey-Pricing techniques are commonly used to assign fixed and common costs in large networks, such as, electrical utilities, telecommunications, etc.

The use of Ramsey Pricing to allocate FAA fixed and common costs required estimates of user demand for services. These estimates depended on the demand for flights, the operating cost of flights, and the incremental cost of each user type's ATS services. For a given user type, a flight of the same aircraft over the same distance which used the same services would bear exactly the same amount of common and fixed costs.

The Ramsey-based method uses measures of various users' "willingness to pay" in assigning costs so that those groups that are willing and able to pay more for the service are assigned a larger share of common costs than user groups who will not pay additional cost and instead would reduce their consumption of the good. The Ramsey Pricing method, which assigns common costs to users in inverse proportion to their elasticities of demand, results in the least distortion from an economically efficient outcome because it minimizes the degree to which users alter their consumption from what would have occurred under marginal cost pricing.

The final allocation of FAA costs to users reflects the incremental costs imposed on FAA by a user group and the common and fixed costs allocated to the user group by the Ramsey optimization. Based on FY1995 cost and use of FAA services, commercial users were allocated \$7.0 billion of the \$8.6 billion in total costs. Two-thirds of the commercial costs were allocated to domestic scheduled jet passenger air carriers. General aviation users were allocated \$1.0 billion of the FAA costs. Public users including the military were allocated \$570 million and overflight activity was allocated \$90 million.

**FINAL ALLOCATION OF FAA COSTS BY LOB AND USER TYPE
FY 1995 (\$MILLIONS)**

	Air Traffic Total	Regulatory Total	Security Total	Airport Total	Total Allocation by User Type	Percent of Total by User Type
Domestic Jet	\$3,130.8	\$393.8	\$488.8	\$1,002.8	\$4,616.2	53.5%
Charter	111.9	14.8	2.9	18	147.6	1.7%
All-Cargo	596.4	77.3	0.0	56.9	730.6	8.5%
International	355.3	53.6	17.2	100.4	526.6	6.1%
Commuter	515.9	45	6.8	105.9	673.6	7.8%
Air Taxi	187.1	56.1	0.0	27.4	270.6	3.1%
Commercial Users	\$4,897.3	\$640.6	\$115.8	\$1,311.5	\$6,965.1	80.7%
GA Piston	295.7	28.7	0.0	122.6	447	5.2%
GA Turbine	464.6	5.9	0.0	43.8	514.4	6.0%
Rotorcraft	37.3	6.8	0.0	1.2	45.3	0.5%
GA Users	\$797.5	\$41.5	\$0.0	\$167.6	\$1,006.6	11.7%
Military	497	12.9	0.0	19.9	529.9	6.1%
Other Public	25.4	0.7	0.0	16.3	42.4	0.5%
Public Users	522.5	13.6	0.0	36.6	572.3	6.6%
Overflights	89.7	0.0	0.0	0.0	89.7	1.0%
TOTAL COSTS	\$6,307.0	\$695.7	\$115.8	\$1,515.3	\$8,633.8	100.0%

Note: The ATS and total allocation exclude approximately \$35 million in flight inspection costs at non-FAA facilities.
Source: GRA Presentation, April 29, 1997.

II. ISSUES WITH THE GRA COST ALLOCATION STUDY

Both Arthur Anderson (Review of GRA Cost Allocation Study, December 17, 1996) and Coopers & Lybrand (FAA-Independent Financial Assessment, February 28, 1997) agree that the GRA Cost Allocation Study provides an acceptable interim basis for allocating FAA costs to broad categories of users. However, a number of issues have been raised about this cost allocation study.

High Levels of Fixed and Common Costs

The GRA Cost Allocation Study allocates a relatively high percentage of fixed and common costs (55% of total costs). These are costs which were neither directly traced nor assigned through cause and effect mechanisms, but were instead attributed to users by means of an allocation method. This large pool of common and fixed costs is due in part to the nature of the services provided by the FAA. As in many large network operations (such as telecommunications), a significant percentage of costs may not depend on the level of output generated (i.e., fixed costs) or may relate to all lines of business (i.e. joint or common costs). In part, however, it also reflects the FAA's current inability to assign costs more directly on the basis of cost accounting.

This high percentage of common and fixed costs makes a sound allocation methodology critical in ensuring that these costs are correctly assigned to users. As the method chosen to allocate these costs can significantly change the share of FAA costs attributed to various users, the choice of allocation methodologies is important.

Method of Allocating Fixed and Common Costs

GRA has allocated the FAA's fixed and common costs by Ramsey Pricing. The basic concept behind Ramsey Pricing is to assign costs to users according to their willingness to pay, which is measured by their elasticity of demand (the percentage change in the quantity demanded in response to a percentage change in price). For example, under a system of Ramsey Pricing in the telecommunications industry, a business customer might pay more for a fixed line than a residential customer, even though the costs to the telephone company are the same for both customers. The fundamental advantage of Ramsey Pricing is that it allows the service provider to achieve cost recovery with minimal departure from economic efficiency. For the FAA, this would allow the agency to fully recover its costs while eliminating as few customers as possible due to increased taxes/user fees. In other words, Ramsey Pricing would charge higher taxes/fees to those consumers who are least likely to change their behavior based on higher costs.

While most reviewers of the GRA Cost Allocation Study agree that Ramsey Pricing will provide the most economic efficient method of full cost recovery, much of the criticism comes from whether the system is "fair". By definition, Ramsey Pricing means higher prices for service beneficiaries with relatively inelastic demand, without regard to why those costs were incurred. For example, Ramsey Pricing allocates a significant proportion of the FAA's fixed and common costs to the Department of Defense as the military's decision to fly is less likely to depend on cost.

- *Proportionate Cost Allocation:*

Another method of common and fixed cost allocation is Proportionate Cost Allocation. This method allocates common and fixed costs according to the same proportions as directly attributable costs were allocated. Proportionate Cost Allocation may result in prohibitive prices for some users. Under the GRA Study, commuter aviation and general aviation would be allocated significant higher levels of common costs than under Ramsey Pricing.

Difference in cost allocation under Ramsey Pricing and Proportional Assignment:

A	B	Ramsey Pricing		Proportional Allocation		G
		C	D	E	F	
<u>User Type</u>	<u>Directly assignable costs</u>	<u>Common costs assigned</u>	<u>Total direct and common costs</u> (B+C)	<u>Common costs assigned</u>	<u>Total direct and common costs</u> (B+E)	<u>Differences between Ramsey and Proportional cost allocation</u> (F-D)
Domestic jet carrier	\$1,972	\$2,644	\$4,616	\$2,059	\$4,031	-\$585
Charter	46	102	148	58	104	-44
Cargo	243	488	731	341	584	-147
International	199	328	527	165	364	-163
Commuter	472	202	674	833	1,305	+631
Air taxi	183	88	271	231	414	+143
General aviation	622	385	1,007	885	1,507	+500
Military	102	428	530	128	230	-300
Other public user	23	19	42	32	55	+13
Overflights	13	77	90	32	45	-45
Total costs	\$3,875	\$4,761	\$8,634	\$4,764	\$8,639	---*

*differences due to rounding

Source: Based on the GAO National Airspace System report, April 1997

Should Certain users be Exempted from Common and Fixed Cost Allocation?

The general aviation community, as well as the military and smaller commercial service providers, have each made the argument that they should not be required to bear any of the FAA’s fixed and common costs, as they are only marginal users of the FAA’s air traffic services and thus have a minor impact on the FAA’s cost structure. However, it should be noted that for general aviation and the smaller commercial service providers, the majority of their costs, as allocated under the GRA Study, are directly assignable.

Need for More Accurate and Complete Cost Data

The FAA will always have a high percentage of fixed and common costs due to the large network nature of its business. However, a cost accounting system will reduce the percentage of common and fixed costs by either assigning more of the FAA’s costs directly to beneficiaries or on a cause and effect basis (i.e., activity based costing). Telecommunications companies, which are often used for benchmarking against the FAA, typically show fixed and common cost between 15% and 30% of total costs. The FAA, with its cost structure, could be expected to reduce its fixed and common costs from 55% to approximately 40% of total costs through cost accounting, and some believe this can be reduced further.

The FAA is in the process of implementing a cost accounting system. While the system is expected to be installed by October 1, 1997, the need to accumulate cost data will likely delay full use of the system for another year.

Demand Elasticity Issues

Ramsey Pricing allocates charges to users according to their willingness to pay as measured by the users elasticity of demand. As part of the formula used to calculate the cost allocation according to Ramsey Pricing, the users’ demand elasticity must be known. Using available data from previous studies, the GRA Study assigns a final flight demand elasticity of -1 for all user groups except GA Piston. A demand elasticity of -1 means that for every 10 percent increase in the cost per flight, there will be a 10 percent decline in the flights taken by the users. Because GA Piston flights are assumed to be more price sensitive, GRA assigned GA Piston an elasticity of -1.5.

The criticism from reviewers of the GRA Study has been that the elasticity data relied upon by GRA dealt with passenger demand, not the demand by airlines and other users for access to the air traffic control system. There is not necessarily a direct correlation between passenger ticket demand and demand for aircraft use of the air traffic control system. GRA does not believe that aircraft demand elasticity data has been collected by any source and therefore, they have relied upon passenger demand data. Both Coopers & Lybrand and Arthur Andersen have recommended in their studies that such information be researched for future refinements of the cost allocation process.

To show the importance of demand elasticity on cost allocation, the GAO created the following chart:

Changes in Common Cost Allocations Due to Alternative Elasticities of Demand (in \$ millions):

<u>User Group</u>	<u>GRA’s base case</u>	<u>Military is less price sensitive</u>	<u>Air carriers are less price sensitive</u>
Air Carriers	\$2,643	\$2,374	\$3,114
Military	\$428	\$835	\$261
All others	\$1,691	\$1,554	1,338

In the base case, both the military and air carriers are assigned an elasticity of demand of -1. In each of the other cases, the group assumed to be less price sensitive is assigned an elasticity of -0.5, while the other group is still assigned an elasticity of -1. Source: The GAO National Airspace System report, April, 1997.

Additional User Types

Under the GRA Cost Allocation Study, all of the FAA’s costs have been allocated to final flight demand by eleven types of aircraft operators (i.e., commercial users, general aviation public...) and overflights, even though substantial FAA costs (i.e., aircraft certification) have little direct connection to the use of the ATC system. The inclusion of additional user categories, such as equipment manufacturers and airports, would strengthen the accuracy and fairness of the costs assignments. It would also:

- avoid cross subsidy presently caused by the bundling together of services;

- permit other users to be charged directly for services;
- encourage greater transparency and efficiency in the use of resources;
- create greater FAA efficiency as the link between cost of services and pricing is made more transparent.

Costs Not Included

The GRA model's total system cost of air traffic services does not include the ATC services provided by the Department of Defense. According to the GAO National Airspace System Report, it may be necessary to include such costs under the new Statement of Federal Financial Accounting Standards No. 4, in which a reporting entity is required to accumulate and report the full cost of its activities for management accounting purposes.

Key Assumptions of the GRA Allocation Study

In order to complete the Cost Allocation Study, several key assumptions were made by both GRA and the FAA. The Commission may need to review these assumptions as any changes could have significant impact on the resulting cost allocations to users.

- *Obligations reflect the full annual cost of FAA services.*

Obligations, which represent firm commitments to spend money, are not necessarily spent in the same fiscal year as they are committed. The GRA Study assumes that Obligations committed in a given year are equivalent to the FAA's outlays for that same year. A change in this assumption will impact the total amount of costs to be allocated.

- *Annual capital investment reflects long-term needs.*

The GRA Study assumes that annual capital investments are sufficient to both fund replacement of FAA facilities and equipment as well as fund modernization programs. A change in this assumption will impact the total amount of costs to be allocated.

- *FAA activity measures accurately capture the consumption of service.*

The GRA Study is based on the assumption that the FAA accurately is able to measure the consumption of its services. A change in this assumption would impact the percentages of cost allocated.

- *Unit costs of production are estimated by facility, service, and user type.*

Differences among facilities of the same type such as time of day, weather conditions, and congestion, are not explicitly accounted for in the GRA Study. A change in this assumption would impact the percentages of cost allocated.

- *All costs are allocated to users.*

The GRA Study allocates the full cost of all FAA services to the Cost Allocation Study user types, including military and public users. In prior FAA cost allocations, a small proportion of costs was allocated to be in the public interest and was allocated to the general taxpayer rather than users. A change in this assumption would impact the percentages of cost allocated.

III. LINKING COST ALLOCATION TO PRICING

Allocating costs is the first step to developing a system of charges based on service provided. The chart below compares cost allocation based on GRA's Study with user taxes/fees collected and General Fund contributions from FY1995. Military, other public users and overflights pay nothing into the Trust Fund. The GRA allocations to all individual user types are higher than the current system due to the General Fund contribution to the FAA. The difference between the Trust Fund totals and the cost allocation is that the Trust Fund is based on appropriations and the allocation is based on obligations.

IMPORTANT TO NOTE:

Note, however, the FAA budget has been relatively flat over the past several years, while the Trust Fund revenues would have increased due to growth in the industry, if the aviation taxes had been in effect for the entire period. For example, the FAA's budget for FY 1998 is \$8.4 billion, while the Trust Fund revenues are projected to be \$6.9 billion (\$6.1 billion - ticket tax, \$426 million - waybill tax, \$154 million - fuel tax, \$303 million - international departure tax). Under this scenario, we would expect a narrowing of the gap between revenues paid and costs imposed for most aviation sectors. This also helps to highlight the current disconnect between aviation revenues and spending in the current budget process.

(Dollars in millions)

A	B	C	D	E	F	G
User Type	Current System using FY 1995 Trust Fund revenues and General Fund Contributions	% of contribution to FAA budget	GRA costing using Ramsey Pricing (FY 1995 Obligations)	% of total costs	Additional cost based on GRA allocation method (D-B)	Comparison between current system and GRA allocation (D/B)
Passenger Air Carrier	\$4,768 (Ticket tax)	57%	\$5,709	66%	\$941	120%
Cargo	361 (Waybill tax)	4%	731	9%	370	202%
International	233 (Int'l departure tax)	3%	527	6%	294	226%
General aviation	172 (Fuel tax)	2%	1,007	12%	835	585%
Military	0	--	530	6%	530	--
Other public user	0	--	42	1%	42	--
Overflights	0	--	90	1%	90	--
General Fund	2,122	25%	n/a	--	--	--
Trust Fund Interest	757	9%	n/a	--	--	--
Total costs	\$8,413	100%	\$8,634 *	100%	\$3,102	--

* Differences due to comparison between obligations and appropriations as discussed above.

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